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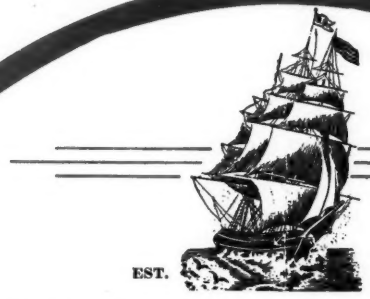
The American Fertilizer

ol. 93 NOVEMBER 23, 1940 No. 11



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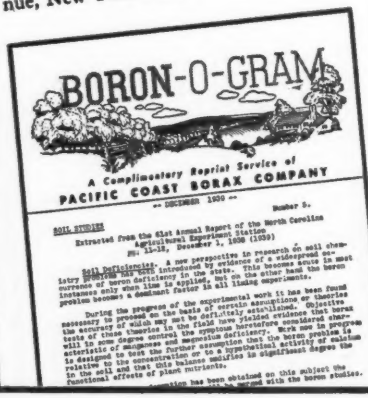
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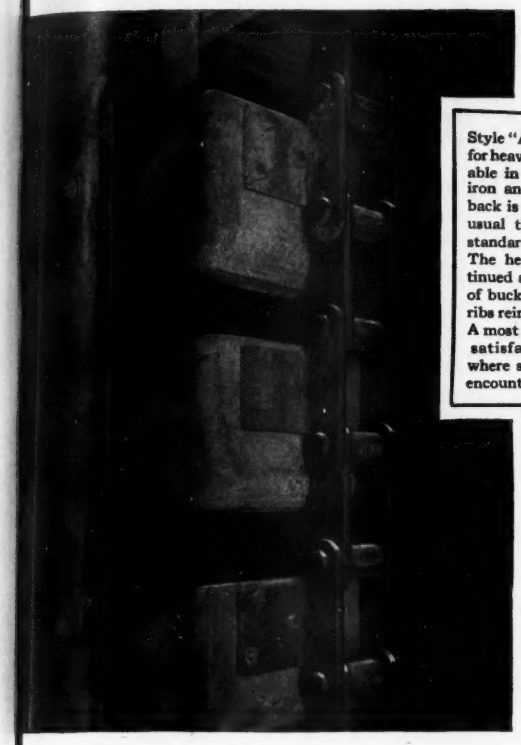

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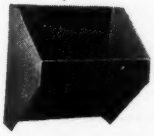

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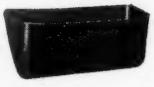

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Vol. 93 NOVEMBER 23, 1940 No. 11

The Influence of Potash Fertilization Upon the Yield and Quality of Tomatoes*

By JACKSON B. HESTER**

THE tomato plant absorbs a large quantity (3, 4. 5)† of potassium. Under certain conditions a larger amount of potash is absorbed by the plant than that of all the other minerals together. In lieu of this fact, potash fertilization studies have been the subject of much research (3). However, many of the findings of these investigations have not been consistently in favor of potash fertilization. It is believed that in explaining these differences two of the main factors have been a lack of knowledge about the available potash (6, 8) in the soil under investigation and the system of fertilization used.

A confusing issue of potash availability is the large amount of unavailable found in most soils and likewise, the lack of a completely satisfactory method of determining that portion that is available to a crop. Soils that carry forty to sixty thousand pounds of total potash per acre (six-inch basis) are not uncommon. With this tremendous reserve in the soil, it once seemed preposterous to think that plants growing upon these soils would become deficient in potassium. However, it has now become common knowledge that the bulk of this potassium is unavailable to present crops or even to many crops to come. In fact only under a system (native forest) where none or very little is removed from the soil do the reserve minerals in the soil maintain plant growth.

Most plants consume large quantities of potassium; however, many of the plants return a large proportion to the soil in the leafy or vegetative portion of the plant. The tomato is different in this respect. A great portion of the absorbed potassium is removed from the soil in the fruit. In one study (3) it was found that 3,000 tomato plants consumed 173 pounds of potash and the fruit removed from the soil approximately 50 per cent of that absorbed. On the basis of this assumption it is interesting to calculate (Table 1) how much potash is removed from the soil by the tomato crop (9). The average ton of tomatoes will contain approximately 6.5 pounds of K_2O; thus, on the basis of the number of tons of tomatoes produced in the various states it can be seen that an enormous amount of potash is removed from the soil each year. Multiply these figures by ten or more years to get the amount removed over a period of time and the figures become astounding. Assuming that the potash removed from six of the Eastern States amounts to 4½ million pounds, that would equal within itself 45,000 tons of mixed fertilizer analyzing 5 per cent K_2O. It should be remembered also that this represents only that which is removed from the soil while there is a like amount returned to the soil in the foliage

Table 1

The Amount of Potash Removed from the Soil by Tomatoes

States	Pounds of K_2O		
	1928-32*	1936-37*	1939**
N. J., N. Y., Pa....	1,840,000	2,540,000	2,488,000
Md., Del., Va.....	1,400,000	2,054,000	3,310,000
Ind., Ohio, Ill.....	2,128,000	3,178,000	3,840,000
United States.....	8,404,000	12,500,000	12,970,000

* Yearly average.
** Estimated, absolute figures not available.

* A paper presented at the meeting of the Division of Fertilizer Chemistry, American Chemical Society, Detroit, Mich., September 11, 1940.

** Soil Technologist, Campbell Soup Co., Dept. of Agricultural Research, Riverton, N. J.

† Numbers in parentheses refer to Literature cited at the end of the paper.

of the plant, and furthermore the above figures represent only the commercial acreage.

Since there is such a large amount of potash absorbed by the plant and since much of this potash is utilized in the formation of fruit, the question of available potash and potash fertilization becomes interesting. In a pot experiment where all of the fruit grown was harvested, the fruit removed nearly all of the potassium (Table 2) absorbed by the plant.

Table 2

Results Showing the High Accumulation of Potash in the Fruit (Toledo Silt Loam)

Potassium* added	Yield† Green weight of fruit	Yield† Total dry weight	Potassium removed* Fruit	Potassium removed* Vines	Quality of fruit
0	989	125	49	8	V. Poor
34	1,128	137	62	8	Poor
68	1,179	136	71	8	Fair
114	1,435	159	93	9	Good
228	1,459	166	102	29	Good

† Grams per pot.
* Milligram equivalents per pot.

Consequently, under some field conditions it is not hard to imagine that practically all of the potassium absorbed by the plant is removed in the fruit.

Available Potassium

It is generally conceded that the replaceable potassium is the primary source of that available. In fact a recent study (4) on a Sassafras sandy loam revealed that replaceable potassium is all available to tomatoes on some soil types and that very little weathering of the clay takes place within a period of twelve months. However, this does not mean that the roots of the plant will come in contact with all of the colloid in the soil. So it cannot be expected that all of the replaceable potash in the soil will be absorbed by any single crop. However, in pot culture experiments a great majority of the replaceable potash may be absorbed.

Pot Cultures

During the years of 1938 and 1939 a series of pot cultures was established for the purpose of investigating the relation of potash fertilization to tomato culture. The following soils were obtained for this work: Sassafras sandy loam, Moorestown, N. J.; Elkton sandy loam, Moorestown, N. J.; Brookston silt loam, Kokomo, Indiana; Toledo silt loam, Toledo, Ohio; Brookston silt loam, Chatham, Canada; and Dundonald sandy loam, Colborne, Canada. For those soils below pH 6.0, lime was applied to bring them to about pH 6.5. Varying amounts of muriate of potash were applied to the topsoil for each pot, thoroughly mixed and 15,000 grams (½ subsoil and ½ topsoil) packed into two-gallon coffee-urn lining pots for further study. Rutgers tomato plants were set in each pot with 1 gram each of ammonium phosphate and ammonium nitrate added as fertilizer. Further applications of ammonium phosphate and ammonium nitrate were added as the plants grew. The results from one of these experiments are shown in Table 3. While there was a gradual increase in yield in many instances in this study, the growth made from the heavier applications of potash did not seem to increase as was accounted for by the absorption of potassium by the plant. It was concluded that the high salt concentration in the high potash cultures had something to do with the lack of growth. The salt bridge (3) revealed a high salt concentration, although

Table 3

*The Influence of Potash Fertilization Upon the Growth and Yield in Various Soil Types**

Mg. replaceable K_2O per pot	Yield in grams per plant — Green weight of fruit	Yield in grams per plant — Total dry weight
	Sassafras Sandy Loam	
34.9	52	12.7
134.2	304	52.6
214.8	840	120.2
359.8	1,436	131.9
582.8	1,253	170.4
969.5	288	57.3
	Elkton Sandy Loam	
37.6	17	16.1
115.4	307	65.9
220.2	633	102.5
308.8	1,319	128.9
491.4	1,619	147.9
974.9	1,478	182.7
	Toledo Silt Loam	
53.7	989	124.6
185.3	1,128	136.5
314.2	1,179	135.7
488.8	1,435	159.5
926.5	1,459	166.5
	Brookston Silt Loam	
75.2	1,203	150.5
206.8	1,347	164.6
335.7	1,528	194.9
596.2	1,606	203.0
	Dundonald Sandy Loam	
110.1	426	118.4
217.5	483	134.5
327.6	522	133.5
545.2	599	144.4
983.0	766	154.2
	Brookston Silt Loam	
77.8	551	119.3
185.3	987	155.6
295.4	894	179.0
513.0	829	245.2
950.7	800	233.5

* 15,000 grams soil in each case—approximately 6 inches of subsoil and 6 inches of topsoil.

not sufficient to kill the plants. Since this high soluble salt concentration (high potash, low nitrogen, phosphorus, calcium and magnesium solution) tended to throw the soluble nutrients out of proportion, a second type of experiment was set up.

Availability of Replaceable Potash

A second set of pots was established whereby muriate of potash was put in one series in varying quantities, and after one week in moist soil the chlorides were leached out. While there were only six inches of subsoil and six inches of topsoil, surprisingly small amounts of potassium actually leached from the soil. (Literature reference 4 gives complete report). Another set of pots was then set up putting just the amount of potassium that had remained in the leached series. The pots were planted with three Rutgers tomato plants and the results in Fig. 1 were obtained. These results showed that with a soluble salt of potassium maximum yield was obtained when only 210 milliequivalents per pot were used, and above this the yields decreased until no fruit was produced at all when 1,082 milliequivalents were used. But, on the other hand, when the potassium was in the replaceable state, the largest yield was obtained with 1,082 milliequivalents of potassium per pot; and furthermore, more fruit was produced in proportion to vegetation, which indicated a more efficient plant. While these applications of potash were abnormally high they were not very much heavier than large row applications of fertilizer. These results would indicate that to get the maximum yield from field applications of potash it should be applied sufficiently in advance of planting to permit the anions to be leached from the soil. This is exactly in accord with many practical growers who say that a good rain is needed after applying the fertilizer before plants are set.

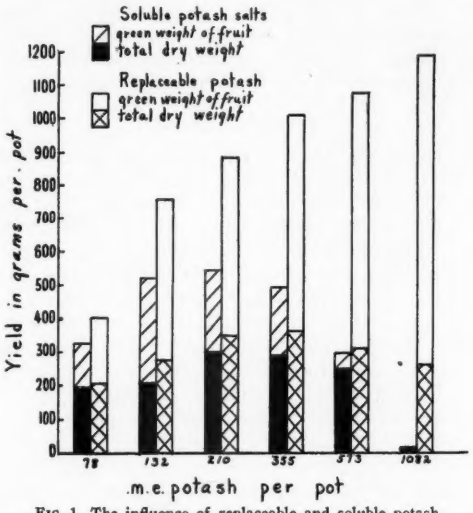

FIG. 1. The influence of replaceable and soluble potash upon the yield of tomatoes.

These studies further revealed that replaceable potash is available to tomatoes on soil types like the Sassafras soil. This work is being extended to other soil types and the findings will be forthcoming.

Replaceable Potassium in Field Soils

The replaceable potassium may be available to plants provided the root system completely permeates the soil as in pot culture work but under field conditions the roots of the plants do not come into immediate contact with all of the colloid in the soil. Consequently it is not possible for one crop to absorb all of the replaceable potassium in the field. However, the replaceable potassium in the average field soil is low enough. In a previous article the relation between the total replaceable potassium and the short test was shown (2). Interpreting the short tests made in 1939, the results shown in Table 4 were obtained.

Table 4

Replaceable Potassium in Top Six Inches of Tomato Soils

Pounds per acre of replaceable	Percentage distribution							
	N. J.	Pa.	Ga.	Canada	Ohio	Ill.	Ind.	Mich.
Sands								
-129	28		68	54				
130-249	71		32	19				
250-	1			27				
Sandy Loams								
-129	30		84	73				
130-249	69		16	23				
250-	1			4				
Loams and Silt Loams								
-129	44	55		76	44	32	62	58
130-249	54	42		23	55	58	37	35
250-	2	3		1	1	10	1	7

Soils with less than 129 pounds of replaceable K_2O per acre require heavy fertilization for maximum crop production. Soils with between 130 and 249 pounds require only moderate fertilization, and soils with over 250 pounds require no fertilization with potash to produce a good crop.

An examination of the results in this table reveals that too many of the soils analyzed in each of the sections are too low in potash for maximum tomato production. Working on the basis of these analyses, a series of experiments under field conditions was set up for the purpose of ascertaining the most efficient amount of potash to add to a soil poor in available potassium.

Field Studies with Potassium

During the summer of 1938 five experiments were conducted in New Jersey where 1,500 pounds per acre of the following fertilizer mixtures were used: 5-8-0, 5-8-7, and 5-8-14. This fertilizer was mixed in the row approximately two weeks before the plants were set. Each one of the experiments were carefully replicated and the following are the average acre yields of the tests: 5-8-0, 6.79 tons; 5-8-7, 7.33 tons; and 5-8-14, 6.84 tons. In other words, the increase for the 14 per cent potash was lacking and not a tremendous increase for the 7 per cent. Under a somewhat similar condition in Pennsylvania with only 1,000 pounds of fertilizer per acre the following yields were the average of three experiments: 4-8-0, 11.08 tons; 4-8-4, 12.96 tons; and 4-8-8, 12.82 tons. Here again the increase was not significant. During the summer of 1939 further experiments were established and somewhat different conditions of applying the fertilizer were used. First, 1,000 pounds of fertilizer was used in New Jersey and 750 pounds in Pennsylvania. Again, soils with a low replaceable potash content were used and the fertilizer was mixed in the soil about two weeks before planting. In New Jersey, under these conditions, the following average yields from six carefully replicated experiments were obtained: no fertilizer, 5.66 tons; 4-16-0, 8.85 tons; 4-16-8, 8.96 tons; 4-16-16, 8.13 tons. And, for Pennsylvania with five experiments the following yields, respectively, were obtained: 8.25, 11.53, 11,68, and 11.93. It is rapidly seen that these results do not justify the application of potash in any large amounts for tomatoes even on soils low in available potash.

With these results in mind the author began to study all available results upon potash work. In 1938 one experiment was conducted, not primarily as a potash study, but fractional applications of potash were used and the results from this work indicated a yield of over 15 tons per acre. In 1939 two further studies were carried on. one with fractional applications of potash as the crop grew and the other with the potash turned down some weeks before planting. Furthermore, 200 pounds of K_2O per acre were used in one case and 250 pounds in the other. The yields were approximately 15 and 25 tons per acre respectively. These results were obtained in a field where row applications of potash before planting were much lower indeed, averaging only 8 to 9 tons per acre.

In face of the two years' results with the potash in the row and with the pot culture work, the author began to study the yields of the Campbell contractors. It was found that in 1939 the heavy users of potash in the row before planting seldom produced over 8 tons per acre whereas with sidedressing and broadcasting methods as high as 19.5 tons per acre were produced.

Upon the basis of these findings and the practical experience, the author advocates the following procedures for potash fertilization of tomatoes: (1) a small amount in the row before planting and the remainder by side dressing (light soil); (2) the bulk broadcast and disked or plowed before planting and some in the row at planting (heavy soil); (3) soil built up in potash by pre-fertilizing cover crops and plowing down the cover crops before planting; and (4) proper systems of band placement with the transplanter.

Potash and Quality

A casual study of the above data might cause one to assume that potash is not too important in tomato culture. However, the yield upon proper fertilization and the influence upon quality make it all important. First, evidence has been published in the literature that potash is not important either from the standpoint of yield or quality. It is believed that the above evidence supports conclusively the fact that the method of application of potash is all-important in tomato production.

In order to investigate the problem of potash fertilization upon the quality, tomatoes were picked from respective plats at about the height of the picking season for quality tests. Dr. E. F. Kohman, Campbell Soup Company, took 25 pounds of fruit from each plat and passed it through a small cyclone and from the yield of pulp calculated the percentage yield of pulp and determined the Vitamin C content upon some filtered extract. He then canned a portion for analysis, cooking just enough to sterilize. He made further analyses for sugars, total solids and insoluble solids, etc. and later the mineral analyses of the pulp were made in my laboratory. These results were averaged for the two years and are given in Tables 5 and 6. Table 5 gives the results where the potassium was applied in such a way that yields were increased.

While the data are not in perfect agreement, several outstanding things are noticed. As the potash content is increased, many desirable qualities are increased. The increase in yield of pulp is very desirable because this means less

(Continued on page 24)

November Crop Report

Crop prospects in the United States improved more than 1 per cent during October, the Crop Reporting Board states. Dry weather during the month in nearly all areas east of the Rockies and generally mild temperatures were favorable for the maturing and harvesting of most late crops. But in the south and southwest the dry weather was decidedly unfavorable for late growth of pastures, grain sorghums, sugarcane, and sweet potatoes.

Many fields of late corn, that had been threatened by early frost, matured with the warm weather and yields are now expected to average 28.2 bushels per acre, the third highest in 17 years. Estimates of corn production have been raised to 2,433,523,000 bushels—an increase of more than 80 million bushels over indications a month ago. The 4 per cent improvement in tobacco prospects brings the estimated yield up to the record high yield of 918 pounds per acre secured last year, and raises the estimate of production to 1,320,000,000 pounds—a nearly average crop.

On the basis of conditions on November 1st, prior to the completion of the fall checkup of acreages harvested, the production estimates for sugar beets and pecans have been increased 5 per cent, peanuts 2 per cent, and cotton, beans, rice, and potatoes each 1 per cent. Expectations of the quantity of sugarcane that will be harvested for sugar have been reduced 11 per cent and the estimates for sweet potatoes, grain sorghum and soybeans 3 to 4 per cent.

Crop	Total Production (in thousands)		
	Average 1929-38	1939	Prelimi'ry 1940[1]
Corn, all, bu.	2,299,342	2,619,137	2,433,523
Wheat, all, bu.	754,685	754,971	792,332
Winter, bu.	571,067	563,431	555,839
All spring, bu.	183,619	191,540	236,493
Durum, bu.	29,619	34,360	37,020
Other spring, bu.	154,000	157,180	199,473
Oats, bu.	1,024,852	937,215	1,218,273
Barley, bu.	225,486	276,298	308,021
Rye, bu.	38,095	39,249	37,452
Buckwheat, bu.	7,617	5,739	5,904
Flaxseed, bu.	10,846	20,330	30,629
Rice, bu.	44,254	52,306	51,924
Grain sorghums, bu.	84,148	83,102	122,949
Hay, all tame, ton	69,650	75,726	84,504
Hay, wild, ton	9,298	8,800	8,927
Hay, clover and timothy,[2] ton	26,030	23,640	28,392
Hay, alfalfa, ton	24,597	27,035	29,973
Beans, dry edible, 100-lb. bag	13,086	13,962	15,130
Peas, dry field, bu.	4,288	3,713	3,292
Soybeans for beans, bu.	27,318	87,409	79,198
Peanuts,[3] lb.	1,035,243	1,179,505	1,574,315
Potatoes, bu.	366,949	364,016	393,931
Sweet potatoes, bu.	72,436	72,679	63,598
Tobacco, lb.	1,360,661	1,848,654	1,319,946
Sorgo sirup, gal.	13,061	10,230	11,257
Sugarcane for sugar, ton	4,439	6,197	4,980
Sugarcane sirup, gal.	21,428	24,909	19,006
Sugar beets, ton	8,937	10,773	11,633
Broomcorn, ton	43	30	42
Hops, lb.	[4]34,310	[4]39,380	40,260
Apples, com'l crop, bu.	[5]121,755	143,085	115,456
Peaches, total crop, bu.	[4]52,723	[4]60,822	52,516
Pears, total crop, bu.	[4]26,333	[4]31,047	32,187
Grapes,[6] ton	[4]2,220	2,526	2,577
Pecans, lb.	63,430	63,639	85,922

[1] For certain crops, figures are not based on current indications, but are carried forward from previous reports.

[2] Excludes sweetclover and lespedeza.

[3] Picked and threshed.

[4] Includes some quantities not harvested.

[5] Average 1934-38.

[6] Production includes all grapes for fresh fruit, juice, wine, and raisins.

The national crop situation is developing about as expected but there can now be much greater assurance that the excellent crops that have been indicated will actually be secured. Although neither the acreage of crops grown nor the yields secured per acre will equal the wonderful showing made in 1937, crop production now seems likely to be larger than in any other season and probably 6 to 7 per cent above the pre-drought average. But the improvement over outturns in exceptionally good crop years such as 1920, 1928, 1931, and 1938 may be only about 1 or 2 per cent.

With a fairly large crop of corn added to the largest or second largest oats, barley, and grain sorghum crops in a dozen years, the production of feed grains for all purposes totals 98.5 million tons or only about 2 per cent below the pre-drought average. This tonnage is large enough to permit feeding present livestock about as liberally as in any of the last 15 years without utilizing any of the large reserves of feed grain accumulated since the drought. With an outstanding crop of sweet sorghum forage to supplement a near-record hay supply, practically all areas except parts of Nebraska report ample supplies of hay and roughage on hand.

The production of most of the principal food crops appears ample. The crops of wheat, rye, and buckwheat are all below the long-time pre-drought averages but as all have been selling at about their feed value in some surplus areas there is no evidence of shortage. Rice and beans are both close to top records and above production in years prior to 1937. More potatoes has been harvested than can ordinarily be utilized for food. On the other hand, the dry

(Continued on page 20)

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PIONEER JOURNAL OF THE FERTILIZER INDUSTRY

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The Atlanta Convention

The Sixteenth Annual Southern Convention of the National Fertilizer Association on November 18th, 19th and 20th drew to Atlanta more than 350 fertilizer executives and technicians, to discuss the problems which face the industry in a world at war. The program which had been arranged afforded ample opportunity for frank statement of opinion on such subjects as national preparedness, government competition in the manufacture and sale of fertilizers, the industry's relations to the public, cooperation in soil improvement work.

In opening the first general session on November 18th, John E. Sanford, of the Armour Fertilizer Works and president of the National Fertilizer Association, pledged the industry's cooperation in national defense. "Our industry is basic to American agriculture and American agriculture is the foundation of national defense," he said. "Every company in the industry and every responsible man in each company must do its part to serve the needs of the Nation in the right way. We are prepared to furnish all the plant food needed for the production of the crops necessary to the National Defense Program." Mr. Sanford added that the industry had a present capacity to manufacture twice as much fertilizer as was being used at present. He also called attention to the increasing government competition, particularly in the manufacture and distribution of phosphatic fertilizers at fictitiously low prices.

Government competition in the fertilizer industry was also considered by two other speakers. "Superphosphate Distribution by the Agricultural Adjustment Administration" was reviewed by J. A. Miller, President, Price Chemical Company, Louisville, Kentucky, and Vice-President of The National Fertilizer Association. Mr. Miller reviewed the subject in the light of the fact that under the 1940 Soil Conservation Program of the AAA, ended September 1st, 175,969 tons of concentrated superphosphate and 160,217 tons of 20 per cent superphosphate have been ordered. From September 1st to November 1st, 16,588 tons of concentrated superphosphate and 33,132 tons of 20 per cent superphosphate have been ordered under the 1941 program. It is understood that the program is to be extended to all States in 1941.

"Government Expansion in Fertilizer Production" was commented on by J. W. Dean, Treasurer of Knoxville Fertilizer Company, Knoxville, Tennessee. His talk was based on

the fact that the production of available phosphate by the TVA continues. Estimates are that 80,000 tons of concentrated superphosphate and 20 000 tons of calcium metaphosphate will be the 1940 production. Most of the superphosphate will be distributed by AAA.

Public Relations

A. Lynn Ivey, President, Virginia-Carolina Chemical Corp., Richmond, Virginia, opened the discussion on public relations.

"Facts—Our Industry's Best Protection" was discussed by Maurice H. Lockwood, Eastern States Farmers' Exchange, Springfield, Massachusetts. He pointed out the little-known fact that fertilizer prices are relatively lower than the prices paid by farmers for other commodities, and that during the last two years the trend of fertilizer prices was downward, while the trend of all commodities was up. "Fertilizer prices are only 5 per cent higher than at the depression low point and all commodities bought by farmers are 22 per cent higher," said Mr. Lockwood.

"Farmers expenditures for fertilizer this year are 44 per cent less than they were 20 years ago, in 1920. But this year they have purchased 50 per cent more plant food than they got in 1920. This is due in part to the increased plant-food content of a ton of fertilizer," Mr. Lockwood explained.

Leon H. Davis, The Southern Cotton Oil Company, New Orleans, Louisiana, gave a report on the "Public Relations Program of a Related Industry," in which he told of the educational program the cottonseed-crushing industry carries on in farming regions.

Soil Improvement Progress

The part which the fertilizer industry plays in the soil improvement and conservation program that is sweeping the country was brought out at the second session of the Convention on November 20th. Further plans for continuing cooperation with agricultural research, extension, and teaching agencies in an attempt to make even more definite contributions to the national program of agricultural education were discussed by Nelson T. White, Vice-President, The Smith Agricultural Chemical Co., Saginaw, Mich., who is also Chairman of the Middlewest Soil Improvement Committee.

He outlined educational projects such as distribution of charts and booklets, setting out approved principles of good farming, the production and distribution of a motion picture on pasture improvement which was widely used throughout the country by schools, colleges, county agents, and extension workers in carrying the message of more and better milk and meat and soil conservation.

Mr. White also announced the coming publication of a book on symptoms of plant food deficiency, "Hunger Signs in Crops," written by a group of nationally known scientists.

"Cooperation with Agricultural Colleges and Experiment Stations" was reported on by W. S. Rupp, Vice-President, The Baugh & Sons Co., Baltimore, Md. Mr. Rupp explained the increasing value of these conferences to the extension workers, county agents, and fertilizer men who attended them, and emphasized these results of this type of cooperation which have in a measure contributed to the reduction of the number of grades of fertilizer in many States as well as an increase in plant-food content per ton of fertilizer.

David D. Long, Manager, Advertising Department, International Agricultural Corporation, Atlanta, reviewed "Industry Cooperation in Agronomic Work" and Dr. Frank W. Parker, E. I. duPont de Nemours and Co., Wilmington, Del.. spoke on "Helping to Solve Southern Agricultural Problems."

The session concluded with a general discussion on "The Fertilizer Industry and National Preparedness."

HAWAII USING MORE FERTILIZERS

Hawaii's purchases of fertilizers from Continental United States during the first 8 months of the current year have been heavier than in the same months of 1939. Ammonium sulphate, the principal commodity, totaled 19,285 long tons, and potassic fertilizer materials 10,159 tons. In both cases the volume approached the totals recorded for the full year 1939. Other items received during the first 8 months of 1940 were other nitrogenous chemical materials (including sodium nitrate, excluding ammonium phosphate), 6,843 tons; superphosphate, 540 tons; natural organic nitrogenous materials, 305 tons; phosphate rock, 203 tons; and fertilizer mixtures, 32 tons.

FERTILIZER APPLICATION COMMITTEE TO MEET

The annual meeting of the National Joint Committee on Fertilizer Application will be held at the Drake Hotel, Chicago, on December 2nd, preceding the meeting of the American Society of Agronomy which will be held at the same place on December 4th, 5th and 6th. The Plant Food Research Committee will also meet on the evening, December

2nd, and the Committee on Fertilizers will hold their meeting on December 3rd.

On September 30th, the Committee on Fertilizer Application voted to appoint a committee to suggest new research projects on the application of fertilizer to corn, soybeans, and cannery peas. Dr. C. E. Millar has announced the following appointments to this committee: Dr. Geo. D. Scarseth, Purdue University, Chairman; A. L. Lang, University of Illinois; Dr. Wm. A. Albrecht, University of Missouri; Prof. C. J. Chapman, University of Wisconsin; Dr. R. L. Cook, Michigan State College; Dr. G. N. Hoffer, American Potash Institute; V. F. Bozeman. John Deere Wagon Works; and Peirce Vandercook, Armour Fertilizer Works. This sub-committee will report at the annual meeting on December 2nd.

November Cotton Report

A United States cotton crop of 12,847,000 bales is forecast by the Crop Reporting Board of the Agricultural Marketing Service, based upon indications of November 1, 1940. This is an increase of less than one per cent over the forecast as of October 1st, and compares with 11,817,000 bales ginned in 1939, 11,943,000 bales in 1938, and 13,547,000 bales, the 10-year (1929-38) average. The indicated yield per acre for the United States of 252.1 pounds compared with 237.9 pounds in 1939, 235.8 pounds in 1938, and 198.1 pounds, the 10-year (1929-38) average.

In the Carolinas, weather during October continued unusually favorable for maturing the late bolls, and prospective production in these two States increased 105,000 bales during the month. Favorable weather also caused an increase of 115,000 bales in Missouri, Arkansas, and Oklahoma. In Georgia, Alabama, and Mississippi, however, dry weather prevented late bolls from reaching full size, and in these States a reduction of 150,000 bales is indicated.

A smaller proportion of the crop than usual was ginned by November 1st in all States except the Carolinas, Virginia, and California. Ginning is especially late this year in the States adjoining the Mississippi River and in Alabama and Oklahoma. The report of the Bureau of the Census shows 9,083,626 running bales (counting round as half bales) ginned from the crop of 1940 prior to November 1st, compared with 10,079,112 for 1939 and 10,124,773 for 1938.

State	Production (Ginnings)[1] 500 lb. gross wt. bales: Average, 1929-38 1,000 bales	1939 Crop 1,000 bales	1940 Crop Indicated Nov. 1 1,000 bales
Missouri	270	437	365
Virginia	37	13	23
N. Carolina	658	457	740
S. Carolina	820	871	960
Georgia	1,175	915	1,032
Florida	34	11	21
Tennessee	472	449	520
Alabama	1,200	785	805
Mississippi	1,619	1,582	1,345
Arkansas	1,283	1,413	1,545
Louisiana	709	745	455
Oklahoma	812	526	825
Texas	3,876	2,846	3,380
New Mexico	99	102	115
Arizona	154	202	197
California	315	443	500
All other	15	20	19
UNITED STATES	13,547	11,817	12,847
Sea Island[2]	...	1.7	4.5
Amer. Egyptian[2]	17	28	39
Lower Calif. (Old Mexico)[3]	42	40	54

[1] Allowances made for interstate movement of seed cotton for ginning.

[2] Included in State and United States totals. Sea Island grown principally in Georgia and Florida. American Egyptian grown principally in Arizona.

[3] Not included in California figures, nor in United States total.

BRADLEY & BAKER

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Norfolk, Va.

1252 West Beaver Street
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FERTILIZER MATERIALS MARKET

NEW YORK

Market Fails to Show Expected Improvement After Election. Organic Prices Being Maintained. Most Chemical Materials in Good Supply.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, November 19, 1940.

Although some observers had looked for considerably increased activity in the fertilizer materials market at the conclusion of elections, such has not been the case and manufacturers show no more than normal buying interest at this time. The same general conditions continue to exist and the organic materials are maintaining surprising strength in the face of limited interest, with only slight advances and reductions to be noted. Chemical fertilizer materials remain very strong and in better than good demand, with suppliers able to meet the domestic call on all items except sulphate of ammonia and triple superphosphate.

Nitrate of Soda

$29.40 per ton in 100-lb. bags, $28.70 in 200-lb. bags and $27.00 in bulk; all f.o.b. port warehouse. Supplies continue to be ample and contracting activity appears to be brisk.

Sulphate of Ammonia

Supply continues to be short of domestic demand and this market remains very tight with no increase in scheduled price. New export interest is noted from Spain but the call in other export markets has slackened off.

Superphosphate

No changes to be noted here and the domestic market is still in a firm position. Price is maintained at 55 cents per unit, producing points. Newest production figures show a considerable increase over previous bids. Triple superphosphate suppliers are hard put to supply the domestic demand, resulting in an extremely tight market.

Potash

All prices are firm and unchanged. Shipments are moving in good volume and supplies of muriate continue to be adequate.

Dried Blood

This market is stronger and several recent sales of local productions have been reported at $2.50 ($3.04 per unit N) f.o.b. Further domestic offerings are scarce at the moment. South American materials shows a decline with last reported business done at $2.45 ($2.98 per unit N) c.i.f.

Tankage

This market has firmed up slightly. Local offerings are on the basis of $2.50 ($3.04 per unit N) and 10 cents f.o.b. for 8/9 per cent unground grade. There are no offerings at this time of South American material because of lack of available freight space.

Nitrogenous Material

No change here and this market remains extremely dull.

Bone Meal

South American 4½ and 50 per cent grade is strictly nominal at $31.00 to $32.00 with offerings being made subject to the seller's obtaining freight space. Domestic material continues scarce with practically no offerings to be noted.

Fish Scrap

Because of lack of supplies, business is impossible. The menhaden meal market at Baltimore is $60.00 per ton, which figure is purely nominal since there are no stocks.

Soya Bean Meal

This market has gone sky high as a result of the holding movement on the part of growers of beans and the fact that crushers have bid up the market about 40 cents per bushel above the low point in August. Soybean meal is now selling at $38.10 per ton in bags delivered Boston or $36.60 in bulk. The

An Apple a Day . . .

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The orchardist, like the farmer and stockman, finds in Sulphur a tried and true friend. Sprays carrying this important element are being used effectively to help produce sound, marketable fruit.

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delivered New York rate points basis is 40 cents per ton less.

Cottonseed Meal

Quite a little business has been done in South American cottonseed meal for import through New York. Further quantities are on offer but, due to higher freight rates, the price has been advanced to $26.00 c.i.f. New York for the denatured grade. All orders are strictly subject to seller's ability to secure freight space.

BALTIMORE

Fall Shipping Season Leaves Carry-Over in Some Materials. Potash and Sulphate of Ammonia Still in Big Demand.

Exclusive Correspondence to "The American Fertilizer."

BALTIMORE, November 19, 1940.

The fall shipping season is now about over, and outside of sulphate of ammonia and potash, there is little interest being shown by manufacturers in supplies of raw materials for the coming spring. Most of them are carrying over stocks from the Fall season, and business at the present time is at a low ebb.

Ammoniates.—The market on feeding materials remains fairly firm, and ground animal tankage ranges from $2.90 to $3.00 per unit of nitrogen, while the market on South American ground dried blood figures about $3.02 per unit of nitrogen, c.i.f. ports.

Nitrogenous Material.—There is practically no activity in this, and the market continues unchanged at $2.55 to $2.65 per unit of nitrogen, f.o.b. Baltimore.

Sulphate of Ammonia.—Many of the fertilizer manufacturers have not yet been able to cover for their entire spring requirements, and first hands report being well sold up and not taking on additional business at schedule price. The export demand continues, and the market for export is around $40.00 per ton, in double bags, f.a.s. Baltimore.

Nitrate of Soda.—Domestic producers and importers quote $29.40 per ton of 2,000 lb., in 100-lb. bags, ex port warehouses; $28.70 in 200-lb. bags and $27.00 per ton in bulk. At this time of the year the demand is light.

Fish Scrap.—Fishing on the Chesapeake Bay is now over, and the catch this year was the smallest for quite a number of years past. With practically no recent arrivals of Japanese sardine meal, the market on fish meal has firmed up, and ranges from $57.00 to $58.00 per ton, in 100-lb. bags, f.o.b. Baltimore. While this is out of range with other protein feed material, it is now beginning to look as though a shortage will develop before the heavy consuming demand is on next spring.

Superphosphate.—There is no change in the market which continues at $8.00 per ton basis 16 per cent for run-of-pile, and $8.50 for flat 16 per cent grade, both in bulk, f.o.b. producers' works, Baltimore.

Bone Meal.—Offerings of bone products are at a minimum and with stoppage of European shipments the demand must be filled from either South American or domestic productions. 3 and 50 per cent steamed bone meal ranges from $32.00 to $34.00 per ton, while 4½ and 47 per cent South American bone meal is quoted at $31.00 to $32.00 per ton, c.i.f. Baltimore.

Potash.—There is a gradual tightening up in this commodity and some of the manufacturers seem to feel that domestic producers will be taxed to the utmost to supply domestic consumption, but as far as can be learned producers are not taking on additional business, and probably will not until current contracts are completed, or in other cases until actual production is increased. The market is still nominally 53½ cents per unit for muriate, in

Manufacturers' Sales Agents for **DOMESTIC**

Sulphate of Ammonia

Ammonia Liquor :: Anhydrous Ammonia

HYDROCARBON PRODUCTS CO., INC.

500 Fifth Avenue, New York

bulk, but there is none to be had at this figure.

Bags.—The burlap market is ruling somewhat firmer, and the present price of plain, new, 10-oz. bags, basis 40 cut 54 in., is about $117.00 per thousand, f.o.b. Baltimore, for spring delivery.

CHICAGO

Greater Activity in Fertilizer Organics Market and Prices Higher with Supply Small. Feed Market Advancing.

Exclusive Correspondence to "The American Fertilizer."

CHICAGO, November 18, 1940.

Considerably more activity has developed in this market, and consequently sellers' asking prices are higher. The continued strength in cottonseed meal and soy bean meal, plus the fear of inflation, contribute largely to the present ammoniate firmness. Stocks in producers' hands are, as previously stated, comparatively small, with no appreciable indication of increasing.

The feed market has been steadily advancing, with the raw material market well sold. Digester tankage list prices have again been advanced.

Nominal prices are as follows: High grade ground fertilizer tankage, $2.50 to $2.60 ($3.04 to $3.16 per unit N) and 10 cents; standard grades crushed feeding tankage, $2.85 to $2.95 ($3.46½ to $3.58½ per unit N) and 10 cents; blood, $2.75 to $2.85 ($3.34½ to $3.46½ per unit N); dry rendered tankage, 60 to 65 cents per unit of protein, Chicago basis.

The Baugh Chemical Company has purchased from the American Agricultural Chemical Company a large tract of land adjoining the Baugh plant in Baltimore.

PHILADELPHIA

Market Continues Inactive. Little Interest Shown By Buyers. Export Sulphate of Ammonia in Demand.

Exclusive Correspondence to "The American Fertilizer."

PHILADELPHIA, November 19, 1940.

Inactivity in the fertilizer material market continues. Prices remained about the same, but very little interest was shown by prospective buyers.

Nitrate of Soda.—Very little being taken on contracts. Price remains $27.00 in bulk; $28.70 in 200-lb. bags and $29.40 in 100-lb. bags in carload lots.

Sulphate of Ammonia.—Strong. Contract shipments being normal. Export demand continues.

Dried Blood.—Firmer. Being offered at $2.45 to $2.50 ($2.98 to $3.04 per unit N).

Tankage.—Holding its own. Demand good. Nominal price $2.50 per unit of ammonia ($3.04 per unit N) and 10 cents per unit of B.P.L.

Bone Meal.—Steady. 1 and 65 per cent at $36.50 to $37.00; 3 and 50 per cent at $33.00 to $34.00; 4½ and 45 per cent at $35.00 to $36.00.

Superphosphate.—Prices unchanged.

Potash.—Schedule prevails.

TENNESSEE PHOSPHATE

Weather Reaches Lowest November Temperature Records. Shipments of Rock Continue. New TVA Construction Work Planned.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., November 18, 1940.

The first taste of real winter temperatures has visited this area during the past week with the thermometer registering lowest recorded

PULVERIZED MASCOT LIMESTONE
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MAGNESIUM LIMESTONE
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A PRODUCT OF NEW MEXICO U.S.A.

A NEW call has gone out to the American potash industry! Foreign supplies of this essential element are virtually cut off. Domestic producers must contribute even greater quantities of potash to safeguard this nation's agricultural and chemical requirements.

The United States Potash Company is geared to do its part in the emergency. Ten years ago this Company sank the first shaft of its mine near Carlsbad, New Mexico. Since then, it has worked consistently to free the United States from dependence upon foreign countries for its supply of potash. To meet today's greater need, our operations are keyed to maximum production. Throughout mine and plant, mining and refining equipment is keeping pace with the latest mechanical developments. A skilled and loyal personnel assures the highest peak of operating efficiency. Conscious of our increased responsibility, we pledge ourselves to the task of striving to assure the United States for all time of sufficient domestic supplies of potash.

UNITED STATES POTASH COMPANY, INC., 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

November figure of 14 degrees, and being below 20 every night for a week and not getting above 45 during any day.

Shipments continue at a moderate rate to the farmers for direct application, to the foundry and blast furnace and the electric furnace consumers, with most superphosphate manufacturers taking only requisite withdrawals against contracts, accumulating nothing unnecessary against inventories.

The water situation has been somewhat relieved, but there is still unusual scarcity for farmers stock water and for phosphate washing plants.

The TVA announced their purpose of building a pumping plant at the mouth of Bear Creek on Duck River, above Columbia, pumping the water to their Akin place for a washing plant to be erected there, between Rutherford and Bear Creeks, and pumping the washed rock and sand about three miles through a pipe line to a nodulizing or sintering plant near Godwin at a point on Rutherford Creek near the L. & N. RR. and near Duck River below Columbia. The proposed plant is also near their present transformer station at Kraus' Crossing, where current comes from all existing power developments on the Tennessee River, from which station lines now radiate to all the electric furnaces, to municipal power service plants and to Rural Electric Membership.

Crops of engineers and workmen are busy at above sites on surveys and locations and it is stated that over one million dollars will be spent in new construction, but whether this includes or contemplates a blast furnace for production of calcium metaphosphate is not stated.

TVA continues to supply large quantities of treble super and some metaphosphate and fused phosphate for demonstration farms and as grants of aid in the soil conservation program of AAA, their program being extended into many more states, but still without in any case establishing test or check strips with ground phosphate rock instead of the manufactured products.

True and outstanding examples of soil conservation and permanently profitable agriculture, with from one fourth to three fourths of land in legumes, with use of only ground phosphate rock have been demonstrated by Frank I. Mann and many other farmers in Illinois, and by Brother Leo, Manager of the Notre Dame farm and a number of others in Indiana, as a result of the teachings of Dr. Hopkins in Illinois. It seems a pity that TVA did not settle the matter by actual demonstration with U. S. taxpayers money, by putting ground rock alongside their manufactured products. Brother Leo was guest speaker at Mt. Pleasant Rotary Club last week, and said he used rock phosphate because it gave him most for his money.

V-C SALES APPOINTMENTS

The Virginia-Carolina Chemical Corporation has announced the appointment of H. S. Vorhes as manager of their sales office at East St. Louis, Ill., succeeding D. K. Lange who recently resigned. The Company has also reopened its sales office at Birmingham, Ala., and has appointed W. D. Barton as manager of that office.

FEDERAL CHEMICAL FILLS SALES OFFICES

The Federal Chemical Company has made the following appointments in their sales department: W. O. Flowers, division sales manager of the Louisville, Ky., office; C. R. Stillings, assistant sales manager at the Columbus, Ohio, office; F. A. Houk, assistant sales manager at the East St. Louis, Ill., office; L. L. Martin, assistant sales manager at the Meridian, Miss., office.

NITROGANIC TANKAGE

Let us tell you about this new fertilizer material. We solicit inquiries.

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BALTIMORE CHICAGO SAVANNAH TAMPA

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"URAMON" Fertilizer Compound
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Urea-Ammonia Liquors
(*Urea and Ammonia Nitrogen*)

DU PONT

E. I. DU PONT DE NEMOURS & CO. (INC.)
AMMONIA DEPARTMENT **WILMINGTON, DELAWARE**

NOVEMBER CROP REPORT

(Continued from page 9)

weather has reduced prospects for sweet potatoes, sorgo sirup and sugarcane sirup, all important food crops in the south. The production of both sweet potatoes and sirup is now expected to be lower than in any year since the drought of 1930. Fruit production was not unusually large but appears ample under present conditions. Combined production of peaches, pears, grapes, cherries, plums, prunes, apricots, and commercial apples is 12 per cent below the 1939 crop, but is about equal to average. Production of pears, grapes, and commercial apples will be somewhat larger than was indicated a month ago. Grapefruit production from the 1940-41 bloom, though 3 per cent smaller than the 1938-39 crop, is expected to be 22 per cent larger than last year. The 1940-41 crop of early and midseason oranges is indicated to be 15 per cent larger than last season.

Fourteen commercial truck crops for fall and winter harvest during the 1941 season show acreages planted and to be planted 16 per cent larger than the acreage harvested in 1940, and 17 per cent larger than the 1930-39 average acreage. Compared with a year ago, increases are indicated for fall snap beans, fall and early cabbage, fall and winter cauliflower, fall eggplant, Virginia kale, early lettuce, early Bermuda onions, Virginia fall spinach, and fall tomatoes. No change is reported for fall carrots and cucumbers, and there are small decreases for California artichokes, fall and winter celery, fall peppers and fall shallots.

In comparison with last year the indicated production of vegetable crops for harvest this fall shows increases of 84 per cent for snap beans, 81 per cent for kale, 50 per cent for spinach, 31 per cent for eggplant, 23 per cent for artichokes, 11 per cent for cucumbers, 8 per cent for tomatoes, 5 per cent for green peppers, and 3 per cent for cauliflower. But shallots show a decrease in prospective fall production of 20 per cent, celery shows 9 per cent, and carrots 7 per cent.

Soybean production is expected to be about 9 per cent below the record crop of last year but the production of both soybeans and flaxseed will be around 3 times the 10-year (1929-38) average. As cottonseed production will probably be about 9 per cent larger than it was last year the combined production of these three oil seeds seems likely to be about 8,900,000 tons, a quantity exceeded only in 1937.

UNCLE NATCHEL RETURNS IN A NEW RADIO SERIES

An old favorite, Uncle Natchel, will return to the air waves on Sunday, November 24th. For the fifth consecutive season, the Natural Chilean Nitrate folks present this lovable old Negro character with the group of young folks. Uncle Natchel continues the type of program that has proved so popular in the past—dramatized stories of highlights and sidelights of early Southern history. The young folks again supply the many old songs which always have been a feature of the Uncle Natchel program. Important stations all over the South are carrying the new Uncle Natchel series. The Chilean Nitrate folks invite everyone to listen to all Uncle Natchel programs. Exact hour of each broadcast is listed in the radio time tables in all newspapers which publish a radio listing. Following is the full list of stations: WAGF, WDBO, WSB, WWL, KWKH, WJDX, WBT, WPTF, WIS, WOLS, WMC, WSM, WRVA, WSFA, WJRD, WJBY.

CLASSIFIED ADVERTISEMENTS

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WANTED: Used equipment for mixing fertilizer. K. C. Livermore, Honeoye Falls, N. Y.

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NO INCREASE IN BORAX PRICES

The American Potash & Chemical Corporation has announced that the current schedule of prices on "The Elephant Brand" borax and boric acid, which expires on December 31st, has been extended without change to cover the first six months' of 1941.

Texas Fertilizer Sales Increase

A detailed report of fertilizer sales by counties in Texas for the 1939-1940 season has been issued by Dr. G. S. Fraps, State Chemist, who is in charge of the administration of the fertilizer laws of Texas. The sales reported by counties this season amounted to 107,950 tons as against 86,036 tons for the previous year. Examination of the amounts sold in the several counties shows that the increased quantities used during the previous season are rather uniformly distributed over the state. In fact, the leading counties this year, with one exception, were the leading counties last year. The largest sales this season are reported from Cass County with 5,322 tons, Harrison County, 4,476 tons, Cherokee County, 4,319 tons, Jefferson County, 4,073 tons, and Smith County, 4,060 tons. The sales were in excess of 3,000 tons in Bowie, Hidalgo, Nacogdoches, and Panola counties. Rusk and Harris counties also purchased practically 3,000 tons.

The sales as reported by counties are lower than the acutal sales, but they account for most of the fertilizer sold. Fertilizers never have been as extensively used in Texas as in some of the states in the Southeast. This may be explained by the fact that much of the rainfall in Texas is irregular and in some cases too scattered to provide sufficient moisture to cause the fertilizer to become available for use by the crops in time to increase the yields. In East and Northeast Texas where the rainfall is more abundant than farther west, nice profits result from the use of fertilizer on cotton, corn, and potatoes, as well as all sorts of truck and fruit crops.

The use of fertilizers to increase yields of cotton is very desirable from several angles provided, of course, their use is profitable. The increases in yield do not involve any additional land nor added cultivation expense. Thus the farmer by adding fertilizer may secure 20 to 30 per cent more yields from which virtually the only deduction needed in arriving at the net profit is the cost of the fertilizers. Since the unfertilized crop must pay for the use of the land and for the seed and the cultivation, the increase in yields due to fertilizer would cost merely the fertilizing materials distributed on the land and the cost of harvesting the increase. It may sometimes happen that an unfertilized crop of cotton will just about pay cost of production and harvesting while the margin in favor of fertilizer becomes the only net income from the farm. In such a case, the use of fertilizer becomes very important and may mean the saving of a home enterprise.

NEW SUPERPHOSPHATE DEFINITION

At the annual meeting of the Association of Official Agricultural Chemists held in Washington during the closing days of October, the following definition of superphosphate was adopted as official: "A product obtained by mixing rock phosphate with either sulphuric acid or phosphoric acid, or with both acids. The grade that shows the available phosphoric acid shall be used as a prefix to the name, for example, 20 per cent superphosphate."

At the annual meeting in 1939, a change in this definition was adopted tentatively, which specified merely that the P_2O_5 content must be chiefly mono-calcium phosphate without specifying the materials from which it might be produced. It was felt by some officials that this definition might permit the production of a "synthetic" superphosphate by mixing limestone and concentrated phosphoric acid. Apparently this viewpoint became more general during the ensuing year, as the definition adopted last month is virtually the same as the old definition which had prevailed for a number of years.

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See Page 4

INFLUENCE OF POTASH FERTILIZATION UPON YIELD AND QUALITY OF TOMATOES

(Continued from page 8)

waste in processing. It goes without saying that an increase in solids, sugars, vitamins and minerals are important. It has been pointed out before that the fruit carries a large amount of potassium. These data clearly indicate the large amount of potassium in the fruit and how easily it is to influence this with potash fertilization.

On the other hand, in Table 6 where the yields were not increased, due primarily to improper methods of application, the results are not so convincing; in fact, they are rather irregular. This, it is believed, would be expected.

It is thought that these results indicate why some growers succeed on the farm and others do not. The question of how to do the job influences the yield as much as doing the job itself. This has been shown in every walk of life.

Yellow Tops and Potash Fertilization

It has been reported in the literature that yellow tops (1) are caused by a lack of potash. The author did not find this to be totally true but potash did decrease the amount of yellow tops found. The results in Table 7 would lend evidence to the fact that potassium is a factor in this so commonly noticed phenomenon. In other words, the increased absorbed potassium appeared to increase the desirable qualities of the tomato. Attention should be called to the fact that other limiting

Table 5

The Influence of Potassium Fertilization Upon the Quality of Tomato Pulp

Pounds K_2O per acre	Yield tons per acre	% Pulp	pH of pulp: Plain	pH of pulp: NaCl added	Color and flavor	Parts per thousand: Total solids	Parts per thousand: Sugars	Parts per thousand: Insoluble solids	Parts per million: Ascorbic acid	H	CaO	MgO	K_2O	N	P_2O_5
0	7.37	77.5	4.2		B—	57.0	30.1	5.62	207	64	64	58	2,355	1,904	
40	9.60	83.5	4.2		B	58.6	30.5	6.08	211	66	78	54	2,496	1,946	
80	10.25	87.0	4.25		B	62.1	36.2	6.40	224	75	78	62	3,365	1,663	
0	12.84	81.5	4.45		A	60.3	35.4	5.95	225	54	64	41	2,999	1,800	
105	13.46	87.5	4.3		A	60.5	31.9	5.61	214	61	87	43	2,792	1,832	
210	13.59	87.5	4.3		A—	61.5	34.2	5.61	214	59	101	50	2,851	1,683	
0	8.35	89.0	4.25	4.05	B—	57.8	34.1	6.60	196	55	106	22	1,805	1,719	139
80	9.31	86.0	4.3	4.1	B—	59.3	37.1	6.60	234	54	101	26	2,444	1,691	134
160	8.69	84.0	4.3	4.15	B—	60.2	37.1	6.40	226	62	106	24	2,519	1,596	133
0	10.65	87.0	4.2	4.0	C	54.3	28.2	6.50	201	63	106	24	2,143	1,848	140
60	12.69	89.0	4.2	4.0	B—	55.0	29.1	5.80	226	65	106	24	2,294	1,714	144
120	12.83	88.0	4.2	4.05	C—	55.0	29.0	5.70	232	67	101	34	2,505	1,613	137

Table 6

Results Showing that Improper Fertilization with Potash May Not Influence Yield or Quality of Tomatoes

Pounds K_2O per acre	Yield tons per acre	% Pulp	pH of pulp: Plain	pH of pulp: NaCl added	Color and flavor	Parts per thousand: Total solids	Parts per thousand: Sugars	Parts per thousand: Insoluble solids	Parts per million: Ascorbic acid	H	CaO	MgO	K_2O	N	P_2O_5
0	10.20	93	4.45	4.35	A	65.5	39.7	6.35	288	53	101	30	2,820	1,719	143
40	10.07	89	4.5	4.3	A	66 3	38.1	6.33	260	59	67	42	3,384	1,618	118
80	7.89	90	4.4	4.3	A—	66.5	39.2	6.10	278	63	87	26	3,346	1,652	155
160	9.47	92	4.45	4.3	A	67.8	40.6	6.90	278	60	67	50	3,760	1,691	120
0	13.92	87	4.55	4.3	A	58.3	37.4	5.38	284	48	88	30	2,256	1,406	133
100	15 05	88	4.35	4.2	B+	59.4	37.5	5.85	257	53	84	16	2,519	1,540	140
200	13.59	90	4.4	4.2	B+	63.8	39.4	6.80	260	55	101	20	2,750	1,529	139
400	14.60	89	4.35	4.15	B+	60.8	34.8	6.03	291	59	84	88	3,121	1,585	139
0	9.77	80	4.2	4.0	B—	52.5	25.4	4.53	193	72	106	50	2,294	1,820	123
30	9.80	89	4.15	4.0	B+	52.3	24.8	5.00	190	74	118	20	2,392	1,803	123
60	8.41	90	4.2	4.05	B	52.5	25.1	5.10	197	72	120	54	2,632	1,798	120

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factors in plant growth must be corrected before proper response to potash is expected. The soils must be limed to the desired pH value and be adequately fertilized with phosphorus and nitrogen (3).

Summary

It was found that replaceable potassium is an important factor in tomato production. The method of fertilization with potassium largely controls the results obtained. Direct application of large amounts in the row under the plant may reduce rather than increase the yield. Proper methods of making available large amounts of potassium to the tomato crop greatly improved the yield and quality of tomatoes for the canning industry.

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Exporters Should Register Trade Marks

Proper trade mark registration is an essential protection to American exporters, the Bureau of Foreign and Domestic Commerce reported recently.

James L. Brown, Chief of the Industrial Property Section, Division of Commercial Laws, writing in the current issue of "Foreign Commerce Weekly," points out that trade marks safeguard owners from unfair practices of foreign competitors and impose certain necessary standards.

Discussing the value of trade marks to American foreign traders, Brown said:

"Those who export their goods to markets beyond the seas should clearly understand that the rights in this valuable class of industrial property, which they may have acquired in the United States, are not extensive beyond our territorial boundaries. The requirements in the laws of those countries in which they seek to do business must be met if the trade mark owner will prevail in any suit for infringement. Every trade mark in use in the United States or recorded in its Patent Office may not necessarily belong, in other countries, to the American user or registered proprietor.

"In the absence of an affirmative act, such as applying for registration under the laws of foreign countries, the American trade mark owner will have no protection abroad, especially if the law requires that certain steps be taken before the right inures. Accordingly, if appropriate steps are not taken to safeguard the property in the trade mark, others may use and/or register it abroad."

American exporters are constantly losing their trade mark rights abroad by failing to take the necessary action in accordance with the provisions in foreign laws. There is hardly a week that goes by in which unfair, if not illegal, attempts to acquire exclusive privileges in well-known American trade marks are not made by unauthorized persons.

Unauthorized registration of American trade marks in countries where the American firm may not be marketing its goods at the time is reported frequently to the Bureau. Very often the foreigner becomes aware of the value of such trade marks and labels and will proceed to obtain an exclusive right to use them by obtaining registration for them.

American firms should register their trade marks in foreign countries even though they are doing little business in those countries.

An American firm engaged in export business, or desiring to extend its trade to foreign countries, often is uncertain as to when it should obtain trade mark registration, and in what countries. As a general rule, in practically all countries of Latin America, and in a number in Europe and other parts of the world, he who obtains registration of a trade mark will obtain ownership thereof, despite the fact that another had prior use.

In the United States, the United Kingdom, and most of the countries of Europe and Asia, protection is afforded on the common-law basis, that is, the first user of a mark is entitled to its exclusive use, although in some of these countries in order to prosecute an infringer it is necessary to prove ownership by registration of the mark.

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Fertilizer Materials

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

CALCIUM-NITRATE
Synthetic Nitrogen Products Co., New York City.

CAL-NITRO
Synthetic Nitrogen Products Co., New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
Du Pont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

CASTINGS—Iron and Steel
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.

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Huber & Company, New York City.
Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.

CONTACT ACID PLANTS
Chemical Construction Corp., New York City.

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

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Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill. and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CYANAMID
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.

Andrew M. Fairlie
CHEMICAL ENGINEER
22 Marietta Street Building ATLANTA, GA.
CABLE ADDRESS: "SULFACID ATLANTA"

SULPHURIC Acid Plants . . . Design, Construction, Equipment . . . Operation . . . Mills-Packard Water-Cooled Acid Chambers, Gaillard Acid-Cooled Chambers, Gaillard Acid Dispersers, Contact Process Sulphuric Acid Plants.

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DRYERS—Direct Heat
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

ELECTRIC MOTORS AND APPLIANCES
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

ELEVATORS
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ELEVATORS AND CONVEYORS—Portable
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill. and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Co., Columbus, Ohio.
International Agricultural Corp., New York City.
Smith-Rowland Co., Norfolk, Va.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.

HOPPERS
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
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Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Power Transmission
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Pumping
Atlanta Utility Works, East Point, Ga.

MACHINERY—Tankage and Fish Scrap
Atlanta Utility Works, East Point, Ga.
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Stedman's Foundry and Mach. Works, Aurora, Ind.

MAGNESIA
California Chemical Co., New York City.

MAGNETS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE AND CARBONATE
Tennessee Corporation, Atlanta, Ga.

MANGANESE SULPHATE
Tennessee Corportion, Atlanta, Ga.

MIXERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Agricultural Corp., New York City.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Du Pont de Nemours & Co., E. I., Wilmington, Del.
Huber & Company, New York City.
International Agricultural Corp., New York City.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

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Chemical Construction Corp., New York City.

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American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
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Huber & Company, New York City.
International Agricultural Corp., New York City.
Jett, Joseph C., Norfolk, Va.
Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

PIPES—Chemical Stoneware
Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

PLANT CONSTRUCTION—Fertilizer and Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Agricultural Corp., New York City.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Synthetic Nitrogen Products Co., New York City.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers and Importers
American Potash and Chem. Corp., New York City.
Potash Co. of America, Baltimore, Md.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Jett, Joseph C., Norfolk, Va.
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SCRAPERS—Drag
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Link-Belt Company, Philadelphia, Chicago.

SCREENS
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SEPARATORS—Air
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SEPARATORS—Including Vibrating
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Link-Belt Company, Philadelphia, Chicago.
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Stedman's Foundry and Mach. Works, Aurora, Ind.

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U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
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SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
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American Agricultural Chemical Co., New York City

TANKAGE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
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Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

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Sackett & Sons Co., The A. J., Baltimore, Md.

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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

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Jeffrey Manufacturing Co., The, Columbus, Ohio.
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UREA-AMMONIA LIQUOR
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SAMUEL D. KEIM

By-Products *and* Fertilizer Materials

(SINCE 1898)

1612 MARKET STREET
PHILADELPHIA, PENNA.

E. DOUGHERTY, JR., Manager

MONARCH
Chamber Sprays

Have replaced other sprays in most plants throughout the world. Made of stoneware. Will not break or crack from temperature changes. Hard lead body and cap.

For Scrubbing Acid Gases

Where acids affect our cast brass or "Everdur" nozzles, Fig. 645, we suggest **Hard Rubber Nozzles.**

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Fig. 6020 **MONARCH MFG. WORKS, INC.**
Westmoreland and Emery Sts., Phila., Pa.

Hayward Buckets

Use this Hayward Class "K" Clam Shell for severe superphosphate digging and handling.
THE HAYWARD CO., 202 Fulton St., New York

GASCOYNE & CO., INC.
Established 1887
Chemists and Assayers
Public Weighers and Samplers
27 South Gay Street - BALTIMORE, MD.

Stillwell & Gladding
Established 1868
WE MAKE ANALYSES OF ALL KINDS
130 Cedar Street :: NEW YORK

The Farmers Fertilizer Co.
Manufacturers
COMPLETE FERTILIZERS
BULK SUPERPHOSPHATE
SULPHURIC ACID
Acid plant capacity, 45,000 tons. Fertilizer plant capacity, 50,000 tons
Get in touch with us. COLUMBUS, OHIO

SHUEY & COMPANY, Inc.
Specialty: Analysis of Fertilizer Materials and Phosphate Rock. Official Chemists for both Florida Hard Rock Phosphate and Pebble Phosphate Export Associations. Official Weigher and Sampler for the National Cottonseed Products Association at Savannah; also Official Chemists for National Cottonseed Products Association.
115 E. BAY STREET, SAVANNAH, GA.

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UP TO 5,000 ACRES OF TENNESSEE
PHOSPHATE LANDS
Mineral Rights or Fee Simple
BEST AND SAFEST PLACE TO INVEST IDLE MONEY
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JETT
BROKER

ALL FERTILIZER MATERIALS
FISH SCRAP for Fertilizer and Fish Meal for Feed, Nitrate of Soda, Sulphate of Ammonia, Potash Salts, Superphosphate (Acid Phosphate), Meals, South American and Domestic Tankage and Blood, Foreign Fish Guano.

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Board of Trade Building
NORFOLK, VA.

WILEY & COMPANY, Inc.
Analytical and Consulting Chemists
BALTIMORE, MD.

Tankage
Blood
Bone
All
Ammoniates

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327
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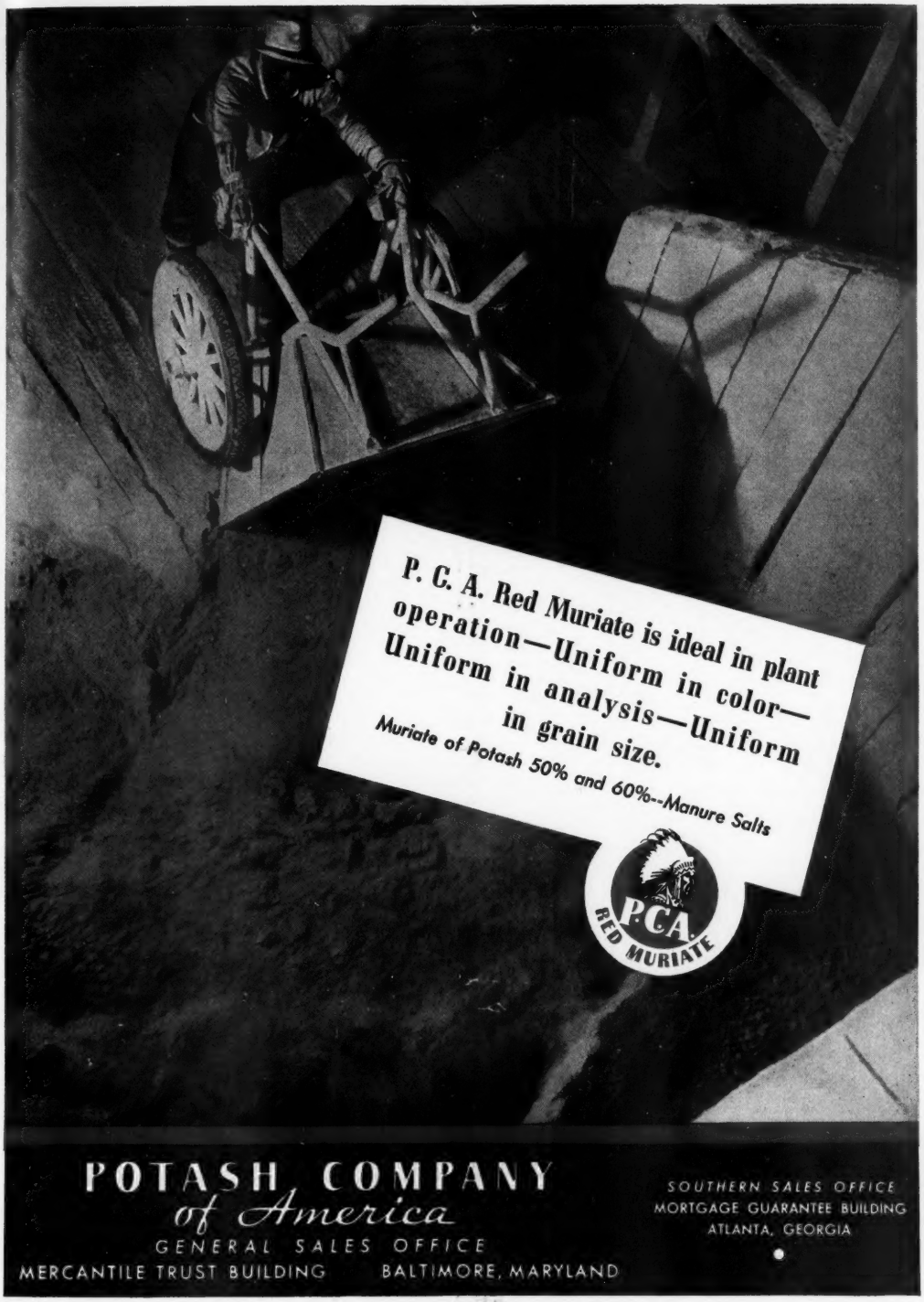
Street
CHICAGO

OFFICIAL BROKER FOR MILORGANITE


P. C. A. Red Muriate is ideal in plant operation—Uniform in color—Uniform in analysis—Uniform in grain size.
Muriate of Potash 50% and 60%--Manure Salts
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POTASH COMPANY
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GOOD HARVESTS are a great basic source of the American way of life. The American pioneer got good harvests by constantly moving to the virgin fertility of vast frontiers. Today America depends upon chemical fertilizers to make old soils new and productive of better living for 130,000,000 people. When these fertilizers are American-made from American materials they build an industry that produces and protects American independence.

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